**Study guide of your final exam (June 11, 2012)**  
  
The exam will cover the materials after mid-term exam. What you need to study:   
(1) Lecture notes (after mid-term exam): Parental care, Social behavior, Cognition,  
       Personality, and Evolution of human behavior.  
(2) Quiz (Quiz #3-5)  
(3) Reading assignments (the articles we discussed).  
(4) Two documentary films (How smart are animals; Ape genius): questions we   
         discussed in class  
  
Email me ([liuw@mail.rockefeller.edu](mailto:liuw@mail.rockefeller.edu)) if you have questions about the final exam.  
  
The final exam includes (1) multiple choice (2) short answer; (3) true or false; (4) short essay.   
  
Make sure you understand the main points of the articles we discussed:   
1. Fatherhood leads to drop testosterone;   
2. Nongenomic transmission across generations of maternal care;    
3. It’s stressful at the top (baboon);   
4. Animal thinking;   
5. What do animals know about numbers;  
6. Alex the parrot;  
7. Do animals have feelings?  
8. Domestication study in silver foxes.  
  
The major concepts that I have been emphasized during the class:

1. Animal behavior (including human behavior) is the product of evolution; animal behavior is evolutionarily adaptive through natural selection (adaptive to species-specific environment). Natural selection may operate through individual or gene (or controversially, through group selection).
2. Identify proximate and ultimate questions, and come up with testable hypotheses and design experiments to test the hypothesis (short essay)
3. Innate and learning behavior: you might realize even the most complex learned (human) behaviors are, to a certain degree, under the control of predisposed genetic program. On the other hand, simple innate behaviors often times can be modified by experience (learned).
4. Species-specific talents: Different animal species have different intelligence to adapt to their environment; some animals can detect magnetic field, some can produce or detect ultrasounds; bowerbirds can build extraordinary courtship arena to court females; and social insects are highly altruistic.
5. Genes and behavior: how do genes control behavior? How do genes interact with environment and indirectly control behavior?  Is there such thing as a monogamy gene or intelligent gene? NO, most behaviors likely result from multiple genes (even hundreds or thousands of genes).
6. Parental care: Sexual conflicts of parental care (under what circumstances is best adaptive for maternal care or paternal care)? Parent-offspring recognition: particularly common in colonial (or more social)  species (why)? Parent-offspring conflicts: infanticide: why do animals evolve infanticide (two hypotheses)? Or sibling rivalry: siblicide? why do parents allow siblicide to happen? Parental care has a big impact on the mental development (stress response) of young, and importantly, this behavior can be passed to the next generation without genetic mechanism (through epigenetic program: environmental agents change the on or off of gene expression).
7. Social behavior: The costs and benefits of social life. Identify different types of social interactions; Examples of social behavior applied to game theory (hawk/dove; tit for tat). Define inclusive fitness and kin selection (examples). Define characteristics of eusocial animals and examples. How did eusociality evolve? (two major mechanisms-inbreeding/haplodiploid)
8. Animal cognition: why it is difficult to study animal cognition? Clever Hans’s story. know the examples of killdeer’s fake “broken-wing”; Empathy in rats, chimps, hippos. How to demonstrate self-awareness in animals -mirror tests in several animal species (elephants, chimps, gorilla, magpies, dolphins); Do animals have emotions? And why do animals evolve emotions, feelings, or personality (evolutionary adaptation)?
9. Animal cognition: what is the function of play? examples of animal plays (do invertebrates play?). Is language required for rational thought? any example in animals? What animals can learn and recognize gesture language?
10. To better understand animal’s mind and intelligence, we need to understand the animal’s natural history. The blue tit has the intelligence to open the milk bottle because, perhaps, a similar skill (e.g., open the tree trunk) has been regularly used by the tit in its daily behavior in nature, but accidentally applied to milk bottle and was rewarded.
11. Differences between chimps and humans: how evolutionary theory interprets such a big gap in between humans and chimps, given the great similarity in genomes.
12. Personality: Personality in invertebrates (octopus) and other species; Personality is partially determined by genes, including personality.   However, a shy person can still be changed to a leader with constant reinforcement and effort, or changing social environment. Why (evolutionary adaptation) do animals evolve different personality (bold/shy)?
13. Evolution of human culture and behavior:  According to evolutionary theory, we can identify the evolutionary roots (shaped by natural selection) in human behaviors, including highly diverse human culture.  Examples like  mate choice, adoption, blood donation, and religions.